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⑤④ **Headed rod member aligning and supplying apparatus.**

⑤⑦ An aligning and supplying apparatus (1) comprises a container (2) to store screws, a chute which gets in the container (2) and is formed on the top surface thereof with a groove (3) having a smaller width than the diameter of the screw head so as to receive the screw shank, means for relatively moving the container and the chute between a first position where the bottom surface of the container and the top surface of the chute meet and second position where the top surface of the chute rises to a predetermined height from the bottom surface of the container, and a first air nozzle (14) which is positioned so as to face towards the top surface of the chute and blows off a screw (23) fallen without getting into the groove of the chute. The screw shank is received into the chute groove when the apparatus is in the first position and the screw (23) which lies fallen on the top surface of the chute is blown off, leaving screws aligned in a row in the groove (3). Thus, the screws stand in a row in the chute.

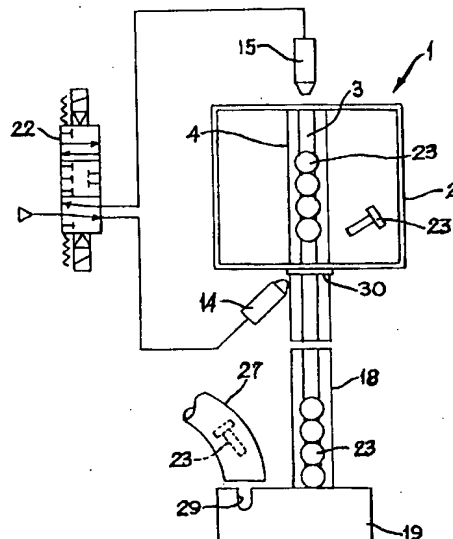


FIG. 5

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There is known a headed rod member aligning and supplying apparatus which is constructed to align headed rod members, such as screws, in a manner that their heads are positioned in the same orientation for supplying the aligned headed rod members one by one. This apparatus is used for automatically feeding screws or the like to an air driver or some other power tool. In the headed rod member aligning and supplying apparatus as presently used, a large number of headed rod members such as screws scattered in pieces are put in a bowl-like container. The container is constructed to be vibrated in a predetermined amount to let the headed rod members ascend in a helical track formed therein. An attachment member mounted on the middle of the track aligns headed rod members in the track by steadying the unstably positioned headed rod members passing through it and removing ones which are positioned more unstably.

As the above-described aligning and supply apparatus of headed ROD members aligns scattered headed rod members, automatic supply of screws or the like to an air driver or some other power tools is possible. Nevertheless, in this apparatus, the form of the attachment member and its position and posture in attaching it to the container heavily depend on experience and skill and a skilled technician is needed to align a large quantity of headed rod members stably.

Accordingly, the present invention aims to provide a headed rod member aligning and supplying apparatus for aligning a large quantity of headed rod members stably without relying on a skilled technician.

According to the present invention, there is provided a headed rod member aligning and supplying apparatus adapted to align headed rod members, such as screws, in a manner such that their heads are positioned in a line and with the same orientation for supplying the headed rod members one by one from the line, characterised in that the headed rod member aligning and supplying apparatus comprises a container to receive a large number of headed rod members; an elongated chute having a portion inserted into the container and a top surface which is formed with a groove of a diameter being smaller than a shank diameter of one of the headed rod members but larger than a head diameter and of a sufficient depth to receive a shank therein; moving means for effecting relative movement between the container and the chute to move both the container and the chute between a first position in which the bottom surface of the container and top surface of the chute rises to a predetermined height from the bottom surface of the container and an air nozzle positioned to be directed toward the top surface of the chute to blow off headed rod members lying fallen without getting into the groove of the chute, and that in the first position, the shanks of a plurality of headed rod members are re-

ceived in the chute groove from the container in which a large number of headed rod members are contained, whereby the shanks of the plurality of headed rod members are contained in the chute groove, the container or the chute is moved by the moving means to take the second position in which the top surface of the chute is raised from the bottom surface of the container, and in the second position, the air nozzle blows off the headed rod members lying fallen on the top surface of the chute to retain only the aligned headed rod members in a row being left in the groove.

In this invention, the chute may be connected to a feed member which extends to escapement means which separates and feeds the aligned headed rod members one by one, and a second air nozzle also may be provided for blowing off air onto the top surface of the chute so as to send the headed rod members aligned in a row in the groove to the feed member.

The present invention is described further by way of example only in the accompanying drawings, in which:

Figure 1 is a perspective view of a headed rod member aligning and supplying apparatus according to the present invention;

Figure 2 is a perspective view of a container; Figures 3a and 3b show the container and a chute in the first position and in the second position, respectively;

Figure 4 is a plan view of the aligning and supplying apparatus prior to aligning screws in a row in the chute;

Figure 5 is a plan view of the aligning and supply apparatus in which a screw lying fallen is blown off from the chute and

Figure 6 is a plan view of the aligning and supplying apparatus in which aligned screws have been fed to a feed member.

For the sake of convenience, headed rod members are represented by screws in the following description but it does not matter if they are T-studs, nails, blind rivets or the like. The aligning and supplying apparatus 1 for screws as headed rod members comprises a container 2 to contain a large number of screws scattered in pieces, an elongated chute 4 having a portion inserted into the container and a top surface which is formed with a groove 3 of a diameter being larger than a screw shank but smaller than a screw head and of a sufficient depth for receiving the shank therein, and a piston-cylinder device 5 as moving means for effecting relative movement between the container 2 and the chute 4 to move them to each other between a first position in which the bottom surface of the container and the top surface of the chute and a second position in which the top surface of the chute rises to a predetermined height from the bottom surface of the container.

The container 2 is described in the following, re-

ferring also to Figure 2. The container 2 is formed as a box opening at its top to store a large number of screws. The centre of a bottom surface 7 is provided with an opening 8 to receive the chute 4. The bottom surface 7 inclines downwardly from side surfaces of the opening 8 so that stored screws can move towards the opening 8 due to gravity.

Corresponding with the chute 4 which is received in the opening 8 of the bottom surface 7, a slot 9 is formed on the side so that an outlet portion of the chute 4 exists from the container 2. Further, the side opposite to the slot 9 is formed with a slit 10 at a position corresponding to the groove 3 of the chute 4. One of the side edges of the container 2 extends crossways, and an extended portion 12 is connected with a piston rod 13 of the piston-cylinder device 5.

The chute 4 is made into an elongated shape so as to form the elongated groove 3 and is also formed in a plate-configuration so as to be received in the opening 8 of the container 2. The piston-cylinder device 5 moves the container 2 and chute 4 to each other between a first position in which the bottom surface 7 of the container and the groove 3 on the top surface of the chute meet and a second position in which the groove 3 of the chute rises to a predetermined height from the bottom surface 7 of the container. In this embodiment, the chute 4 is fixed and an extended portion 12 of the container 2 is connected to the piston rod 13 of the piston-cylinder device 5 so that the container 2 can be moved up and down. Alternatively, the container 2 may be fixed and the chute 4 may be moved. It is also possible to move both the container 2 and the chute 4. The first position and the second position referred to in the above, are described in the following, with reference to Figure 3a which shows the second position to which the groove 3 of the chute is raised, a predetermined height from the bottom surface 7 of the container, while Figure 3b shows the first position in which the bottom surface 7 of the container and the groove 3 on the top surface of the chute meet.

The aligning and supplying apparatus 1 is equipped with a first air nozzle 14 to blow off air to the groove 3 of the chute 4 so as to blow off headed rod members lying fallen without getting in the groove 3 of the chute 4. In order to send the screws aligned in the chute groove 3 to the outlet portion of the chute 4, a second air nozzle 15 is provided to blow off air from the outside of the container 2 via the slit 10 the chute groove 3. In the outlet portion of the chute 4, an elongated feed member 18 is formed with a groove 17 which is similar to the chute groove 3. As shown in Figures 4 through 6, the feed member 18 extends to an escapement device 19 to separate and feed the aligned screws one by one. In the predetermined position of the feed member 18, a sensor 20 is positioned to detect the screws in the groove 17 so that the sensor detects the screws being fed to the escapement

device 19. As shown in Figures 4 through 6, the first air nozzle 14 and the second air nozzle 15 are controlled to change their direction or to stop by a 3-position directional control valve 22.

How screws are aligned in a manner that their heads are positioned in the same direction by means of the aligning and supply apparatus 1 constructed as stated above will now be described with reference to Figures 3a and 3b, 4, 5 and 6. As shown in Figure 3a, a large number of screws 23 are stored in the container, scattered in pieces, in the second position in which the chute groove 3 is at a predetermined height from the bottom surface 7 of the container. Then, the piston-cylinder device 5 is actuated to raise the container 2 to the first position in which the bottom surface 7 of the container and the groove 3 on the top surface of the chute meet as shown in Figure 3b. In the first position, the many screws 23 move along the slopes of the bottom surface 7 of the container towards the chute groove 3. The shanks 24 of the screws 23 are received in the chute groove 3 and their heads 25 are brought into engagement with the top of the groove so that the screws are suspended by the groove. Thus, the screws 23 are aligned in a row in the groove 3 with their heads being positioned in the same orientation. When the shanks of the plurality of screws 23 stay in the groove 3, the container 2 is brought down by the piston-cylinder device 5 to the second position (Figure 3a). As shown in Figure 4, however, some screws lie fallen on the top surface of the chute as their shanks have failed to get in the groove 3 of the chute 4. Therefore, as shown in Figure 5, the directional control valve 22 is actuated in the second position to feed air to the first air nozzle so that the screw lying fallen on the top surface of the chute 4 can be blown off. This allows only the aligned screws to be left in the groove 3.

After a large number of screws are aligned in the chute 4 as described above, the directional control valve 22 is actuated to stop feeding air to the first air nozzle 14 and instead, to supply air to the second air nozzle 15 for feeding the aligned screws to the feed member 18. The feeding may be carried out by sloping the chute 4 instead of feeding air as done by the second air nozzle. The screws transferred to the feed member 18 are detected by the sensor 20 and the feeding of the screws if forwarded to the escapement device 19. The escapement device 19 receives the screw at the head of the line into a recess as shown in Figure 4 to move to a feed tube 27 as indicated by the arrow. In the position shown in Figure 5, the screw is vacuum-sucked from the recess 29 of the escapement device 19 to the feed tube 27 and is directly fed to a power tool such as a pneumatic screw driver. Then, as shown in Figure 6, the escapement device 19 returns to receive the screw at the head of the aligned screws again to send the lead screw to the feed tube 27 in accordance with the demand from the

power tool. When all the aligned screws in the feed member 18 have been sent out, the screw aligning operation is repeated on the chute 4. As shown in Figures 4 through 6, the chute 4 may be provided with a gate 30 in a portion just out of the container 2 for separating the work of aligning screws from the feeding of aligned screws to the feed member.

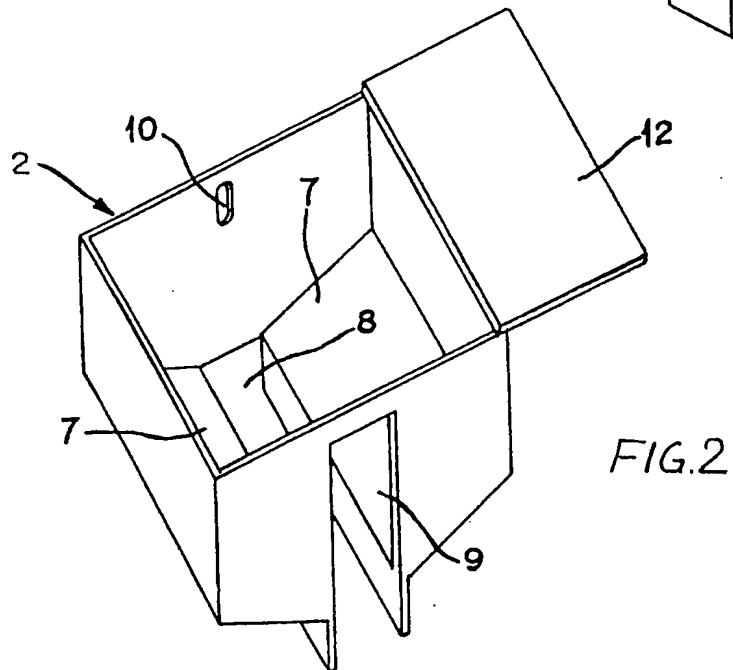
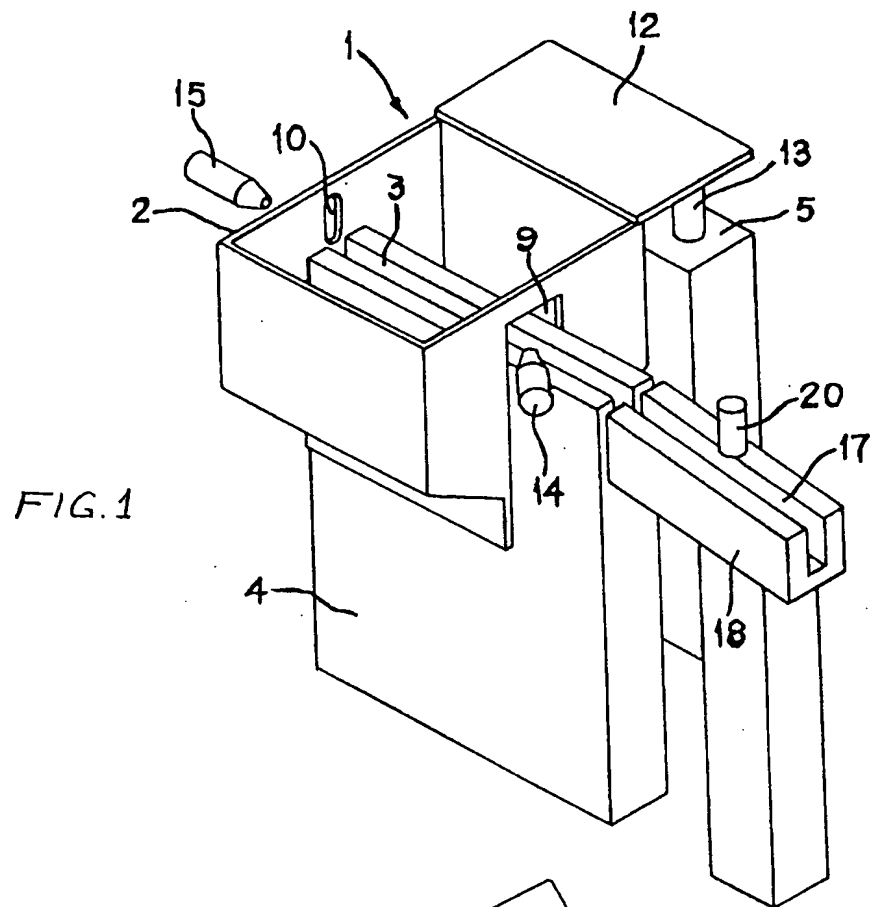
The aligning and supplying apparatus according to the present invention is equipped with a container and a chute having a groove on the top surface thereof with a portion of the chute inserted into the container, and the container and the chute are moved to each other between a first position in which the bottom surface of the container and the top surface of the chute meet and second position in which the top surface of the chutes rises to a predetermined height from the bottom surface of the container. In the first position, the shanks of a plurality of headed rod members are received from the container into a groove of the chute and in the second position, the headed rod members lying fallen on the top surface of the chute are blown off by means of an air nozzle so as to leave the aligned headed rod members in the groove. Thus, an aligning and supplying apparatus which is made up of components of simple structures but is capable of aligning the headed rod members reliably without requiring a skilled technician is provided. Therefore, it is possible to mass-produce the headed rod member aligning and supplying apparatus to align a large quantity of headed rod members stably without relying on a skilled technician.

Claims

1 A headed rod member aligning and supply apparatus adapted to align headed rod members such as screws in a manner such that their heads are positioned in a line with the same orientation for supplying the headed rod members one by one from the line, characterised in that the headed rod member aligning and supplying apparatus (1) comprises a container (2) to receive a large number of headed rod members (23), an elongated chute (4) having a portion inserted into the container and a top surface which is formed with a groove (3) of a diameter being smaller than a shank diameter of a headed rod member (23) but larger than a head diameter and of a sufficient depth to receive a shank therein, moving means for effecting relative movement between the container (2) and the chute (4) to move both the container and the chute between a first position in which the bottom surface of the container and the top surface of the chute meet and a second position in which the top surface of the chute rises to a predetermined height from the bottom surface of the container, an air nozzle (14) positioned to be directed towards the top surface of the chute to blow off headed rod members lying fallen without get-

ting into the groove of the chute, and that in the first position the shanks of a plurality of headed rod members are received in the chute groove from the container in which the large number of headed rod members are contained, and whereby the shanks of the plurality of headed rod members are contained in the chute groove, the container or the chute is moved by the moving means to take the second position in which the top surface of the chute is raised from the bottom surface of the container, and in the second position, the air nozzle (14) blows off the headed rod members lying fallen on the top surface of the chute to retain only the aligned headed rod members in a row being left in the groove.

2 The aligning and supplying apparatus according to Claim 1, characterised in that the chute is connected to a feed member (18) which extends to escapement means (19) which separates and feeds the aligned headed rod members one by one, and a second air nozzle (15) is provided for blowing off air onto the top surface of the chute so as to send the headed rod members aligned in a row in the groove to the feed member.



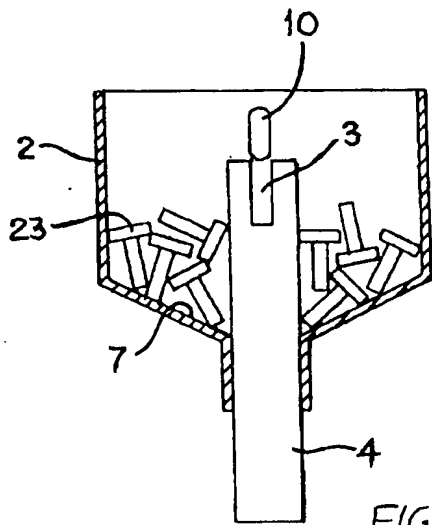


FIG. 3A

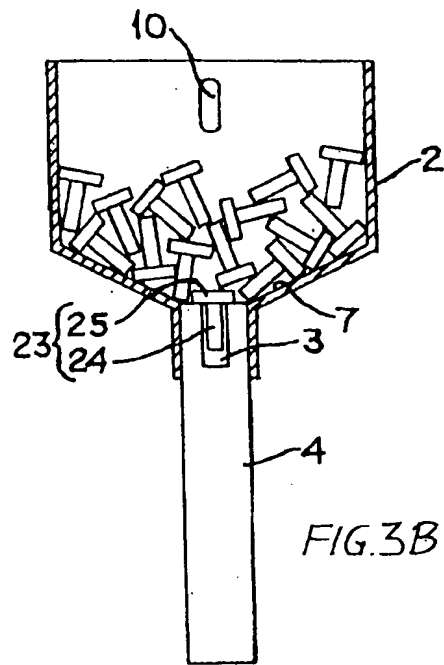


FIG. 3B

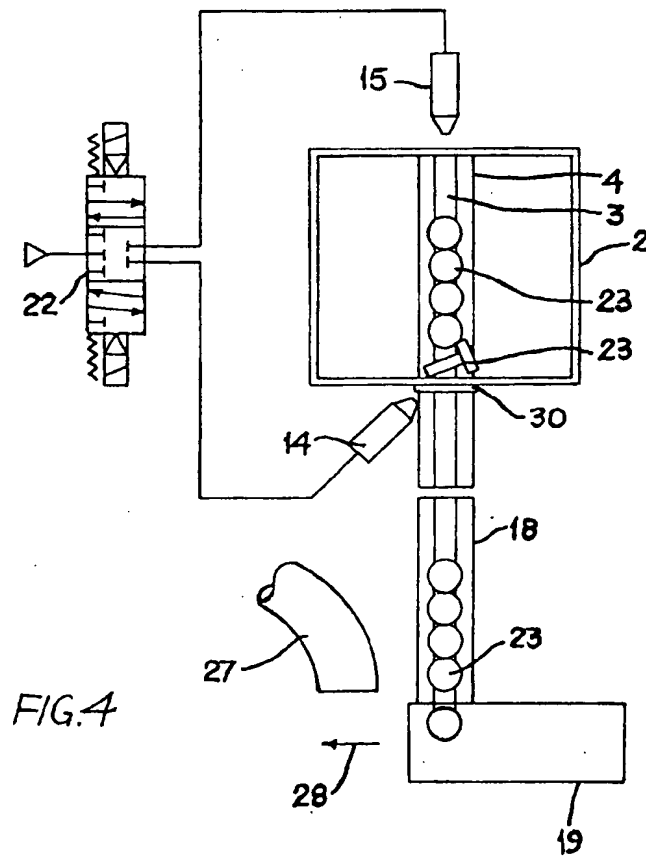
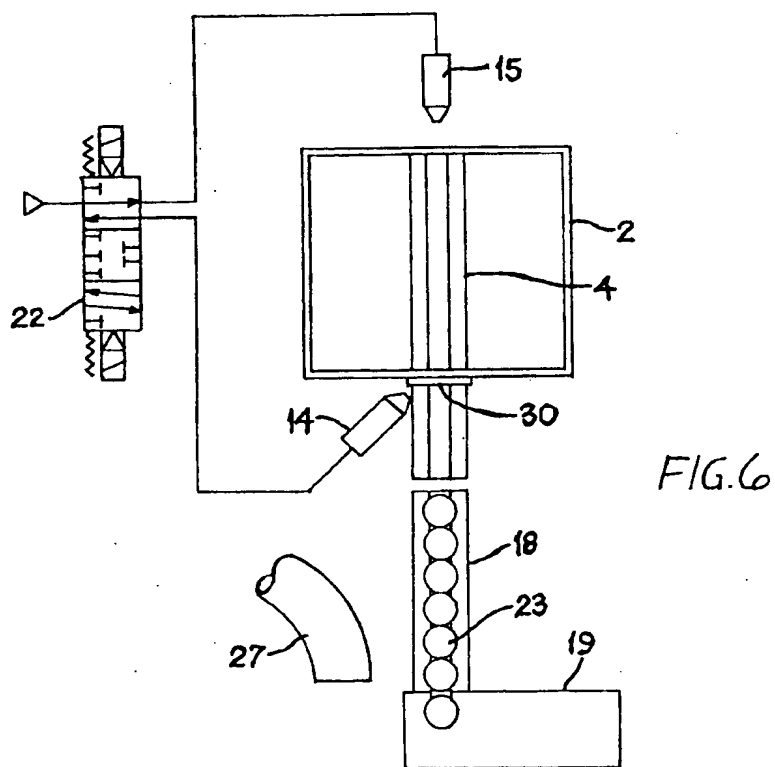
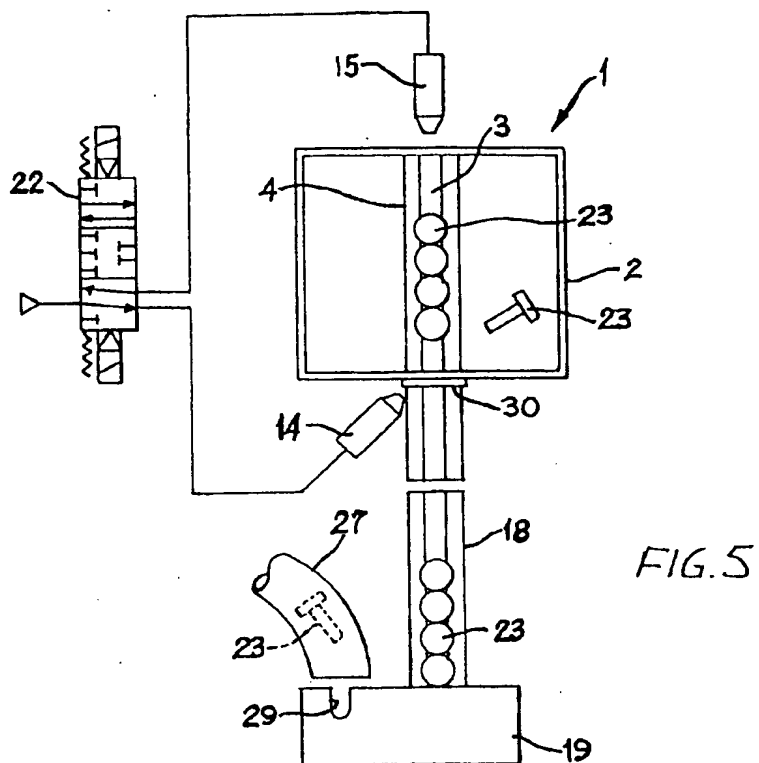


FIG. 4





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 94 30 6630

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	GB-A-2 179 643 (SONY CORP.) * abstract; claim 1; figures *	1,2	B23P19/00 B65G47/14
Y	US-A-4 732 296 (HECK ET AL) * column 4, line 33 - line 45; claim 1; figures *	1	
A	EP-A-0 268 462 (RUVO AUTOMATION CORP.) * column 5, line 64 - column 7, line 45; figures *	2	
A	GB-A-807 442 (TAYMOUTH INDUSTRIES LTD) * page 2, line 22 - line 92; figures *	1,2	
A	FR-A-2 590 817 (AEROSPATIALE) * page 9, line 18 - page 10, line 5; figures 14,15A-15C *	1,2	
A	EP-A-0 057 103 (MATSUSHITA) * claims 1,2; figures *	1,2	<div>TECHNICAL FIELDS SEARCHED (Int.Cl.6)</div> <div>B23P B65G B25B B23Q B21J</div>
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 12 December 1994	Examiner Plastiras, D
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